Kollmorgen Automation Suite

30 Minutes to Motion User Manual

For safe and proper use, follow these instructions.
Keep for future use.

KOLLMORGEN

Copyrights, Licenses, and Trademarks

PCMM2G

The PCMM2G's Operating System (OS) and boot loader (U-Boot) are based on free and open-source software, distributed under version 3 of the GNU General Public License as published by the Free Software Foundation. For more information about your rights and obligations with GPL-3.0, see the GNU website: GNU General Public License.

The individual copyright notices, license texts, and disclaimers of warranty for the software components are located in the controller, under the directory: /usr/share/common-licenses/.

For more information about accessing the PCMM2G's files, see SSH Login to a Controller.

The OS, bootloader, and their software component's source codes including modifications, copyright notices, license texts, disclaimers of warranty, and the compilation scripts to build the OS image are available from the Kollmorgen web-site Kollmorgen Support Network - Downloads.

The OS image and its corresponding sources file is identified by an "OS-Sources" designator, followed by its version number: OS-Sources-x.xx.x.xxxxx.

The compilation scripts and sources file used to build the OS image is identified by the "OS-Build-Sources" designator, followed by its version number: OS-Build-Sources-x.xx.x.xxxxx.

See PCMM2G - File Naming Conventions in the KAS online help.

Copyrights

Trademarks

Regal Rexnord and Kollmorgen are trademarks of Regal Rexnord Corporation or one of its affiliated companies.

- KAS and AKD are registered trademarks of Kollmorgen.
- EnDat® is a registered trademark of Dr. Johannes Heidenhain GmbH.
- EtherCAT is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH.
- Ethernet/IP Communication Stack: copyright (c) 2009, Rockwell Automation.
- Ethernet/IP is a registered trademark of ODVA, Inc.
- Ghostscript is a registered trademark of Artifex Software, Inc. and is distributed under the AGPL license.
- HIPERFACE® is a registered trademark of Max Stegmann GmbH.
- PLCopen is an independent association providing efficiency in industrial automation.
- PROFINET® is a registered trademark of PROFIBUS and PROFINET International (PI).
- SIMATIC® is a registered trademark of SIEMENS AG.
- SyCon® is a registered trademark of Hilscher GmbH.
- Windows® is a registered trademark of Microsoft Corporation.

Kollmorgen Automation Suite is based on the work of:

- 7-zip (distributed under the terms of the LGPL and the BSD 3-clause licenses - 7-zip - License)
- C++ Mathematical Expression Library (distributed under the MIT License)
- civetweb: Embedded C/C++ web server software (distributed under MIT License)
- curl software library
- jsoncpp software (distributed under the MIT License – see jsoncpp License)
- Mongoose software (distributed under the MIT License - see Mongoose license)
- Qt cross-platform SDK (distributed under the terms of the LGPL3; Qt source is available on KDN)
- Qwt project (distributed under the terms of the Qwt - GNU Lesser General Public License)
- U-Boot, a universal boot loader is used by the AKD PDMM and PCMM (distributed under the terms of the GNU General Public License). The U-Boot source files, copyright notice, and readme are available on the distribution disk that is included with the AKD PDMM and PCMM.
- Zlib software library

All other product and brand names listed in this document may be trademarks or registered trademarks of their respective owners.

Disclaimer

Technical changes which improve the performance of the device may be made without prior notice!

This document is the intellectual property of Kollmorgen. All rights reserved. No part of this work may be reproduced in any form (by photocopying, microfilm or any other method) or stored, processed, copied or distributed by electronic means without the written permission of Kollmorgen.

The information in this document is believed to be accurate and reliable at the time of its release. Kollmorgen assumes no responsibility for any damage or loss resulting from the use of this help, and expressly disclaims any liability or damages for loss of data, loss of use, and property damage of any kind, direct, incidental or consequential, in regard to or arising out of the performance or form of the materials presented herein or in any software programs that accompany this document.

All timing diagrams, whether produced by Kollmorgen or included by courtesy of the PLCopen organization, are provided with accuracy on a best-effort basis with no warranty, explicit or implied, by Kollmorgen. The user releases Kollmorgen from any liability arising out of the use of these timing diagrams.

Table of Contents

1   Key Features

Kollmorgen Automation Suite is a Kollmorgen all-in-one solution for designing, developing, and maintaining automation systems. It integrates these three main functionalities of a machine:

- Interface with machine operators (HMI)
- Logic handling of the machine (IEC 61131-3 Soft PLC)
- Precise control of all moving parts (Motion control)

1.1   KAS-IDE

KAS comes with an Integrated Development Environment (IDE) used to:

- Create new application project using KAS predefined or custom application templates.
- Define the machine hardware architecture as well as the machine program.
- Develop PLC programs using the IEC 61131-3 programming languages (FBD, FFLD, IL, SFC, and ST) and KAS function block libraries dedicated to motion.
- Centrally manage all IEC 61131-3 variables with the KAS variable dictionary and map logical variables to physical inputs and outputs.
- Set up HMI panels and map graphical object to IEC 61131-3 variables.

1.2   Main Tools

Tool	Description
Cam Profile Editor	Used to create or modify a profile definition that describes the position evolution of the cam in a 2D graphical format.
Pipe Network Editor	Graphical tool describing the mechanical System into the logical world based on an one to one translation.
Simulator	Used to develop your application without any hardware available.
Softscope	Used to view in a two-dimensional graph one or more variable's evolution (vertical axis) across the time (horizontal axis).

2   Install KAS-IDE

2.1   System Requirements

These are the minimum system requirements for the KAS-IDE.

Element	Description
Connectivity	• 1 Ethernet port, at either 100MB or 1GB. • See Note #2.
Display	• WXGA+ (1440 x 900) or higher-resolution monitor with 24-bit, 16.7M colors. • See Note #1.
Memory	1GB RAM (for 32-bit) or 2GB RAM (for 64-bit) or greater (recommended for complex applications).
.NET Framework	4.8.1
Processor Type	Intel® Pentium® M or equivalent processor at 1.5GHz or greater.
Storage	16GB (for 32-bit) or 20GB (for 64-bit) of free space on hard disk.
Supported Operating Systems	• Microsoft® Windows® 10 (32-bit or 64-bit). • Microsoft® Windows® 11 (64-bit). • For optimal performance, verify the operating system is fully updated with the latest patches.
Web Browser	• A modern web browser is required to access the web server and online help. • We recommend Microsoft Edge.

NOTE

1. Better results are achieved with OpenGL and 3D cards.
2. A 100MB network is required to allow the KAS-IDE to Runtime communication to work in all conditions. The AKD WorkBench AutoTuner and Scope both require 100MB of bandwidth to function properly.

➘ TIP

See Connect Remotely about the ports used by the KAS-IDE.
The ports may need to be opened to support connecting from an external network.

2.2 Digital Signatures

The KAS-IDE Installer and the executables are digitally signed to protect the integrity of these files and identify the distributor of the software components.

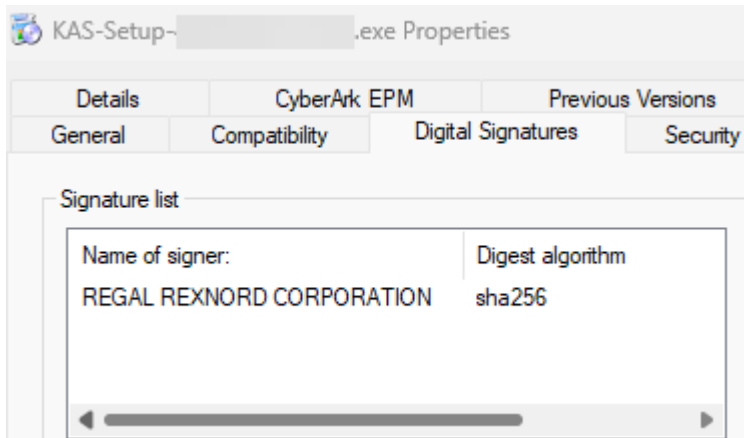The digital signature appears as part of the file properties.

Figure 2-1: Example: KAS Setup Properties Digital Signature

2.3 Download

The latest version of the Kollmorgen Automation Suite is available from KDN.

See KAS IDE Distribution to download the latest or older versions.

> **NOTE**
> This is a restricted community.
> You must be given access based on having purchased KAS.
> If you do not have access, contact Kollmorgen support.

2.4 Installation Procedure

> ⓘ **IMPORTANT**
> Installation of the KAS-IDE can require you to change your firewall setting.
> If you do not have sufficient privileges to configure your firewall, you must stop the relevant Windows Service.

Once KAS has finished downloading, complete these installation steps:

1. Double-click the **KAS-Setup-<<KAS-VERSION-ID>>.exe** file to run the installation Wizard.
   > ⓘ **IMPORTANT**
   > The **Verified Publisher** in the installation wizard dialog must be **REGAL REXNORD CORPORATION**.
2. Click **Yes** to start the installation Wizard.
3. While the setup is loading, wait for the setup splash screen to vanish after being displayed.
   The Welcome Wizard displays with the version and build number of the KAS-IDE.
4. Click **Next** to continue.
5. Review the License Agreement and click **I Agree** to continue the installation.
   > **NOTE**
   > You must accept the agreement to install KAS.
6. Select the **Development Environment** installation type from the drop-down menu.

Installation Type	Description
Development Environment	This installation is typically used for creating and developing a new application. When you need to install the KAS-IDE and the KAS Runtime Simulator, select Development Environment as the type of installation.
Custom	You can manually select the specific KAS components to install.

7. Click **Next** to access the destination folder.
8. Accept the recommended default location or
   Click **Browse** to specify a custom install directory.
9. When finished, click **Install** to continue.

↖ TIP

Kollmorgen recommends accepting the default destination folder under C:\Program Files\Kollmorgen\Kollmorgen Automation Suite\Kollmorgen Automation Suite <<KAS-VERSION-ID>>.

10. The software installation begins.
    Wait until the installation process is complete.
11. Click **Finish**.

↖ TIP

- Adding the **KAS-IDE** application as an exception in your firewall settings is recommended to avoid security issues.
- See the FAQ entry How can I fix security issues? about firewall recommendations.

2.4.1 User Data

User-generated data such as log files, project sources, field bus configurations, function blocks, etc. are stored in the Windows® User directory and are maintained between installations. This applies to files on AKD PDMMs, PCMMs, and Simulator files.

3   Explore the KAS Workspace

This section helps you become familiar with the KAS-IDE.

3.1   Windows and Panels Overview

3.1.1 Main Window

The KAS-IDE interface provides an all-in-one-window integrated workspace.

The main view in the Integrated Development Environment (IDE) is a Multiple Document Interface (MDI) environment. This provides an easy-to-use and customizable view, including the ability to hide, enlarge, or overlap windows in order to optimize visibility.

The main view is saved when you exit KAS-IDE. This ensures that your workspace remains the same each time you open and use the KAS-IDE.
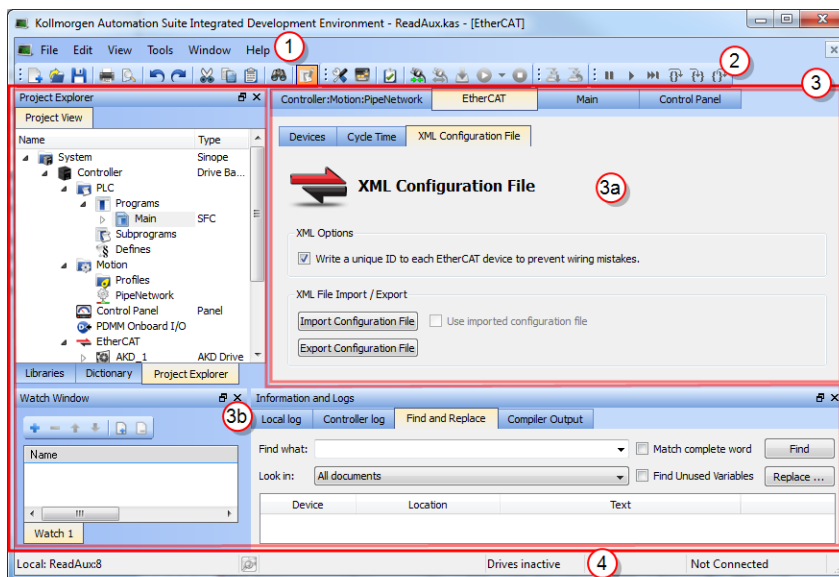
The KAS-IDE main window contains these items:

Figure 3-1: KAS Main Window

Item Number	Description
1	Menus
2	Toolbars
3	Workspace
3a	This area is specifically used for the workspace children windows.
3b	Several toolboxes A toolbox is a child window that provides some functions to perform specific tasks.
4	Status Bar - Shows the current state of the target.

3.1.2 Toolboxes

These are the available toolboxes:

- "Project Explorer" (➜ p. 10)
- "Libraries" (➜ p. 10)
- "Information and Logs window" (➜ p. 12)

3.1.3 Project Explorer

The Project Explorer toolbox window displays machine application information in a tree-structure representation.

This window contains all the items used to design, implement, test, and document the application.
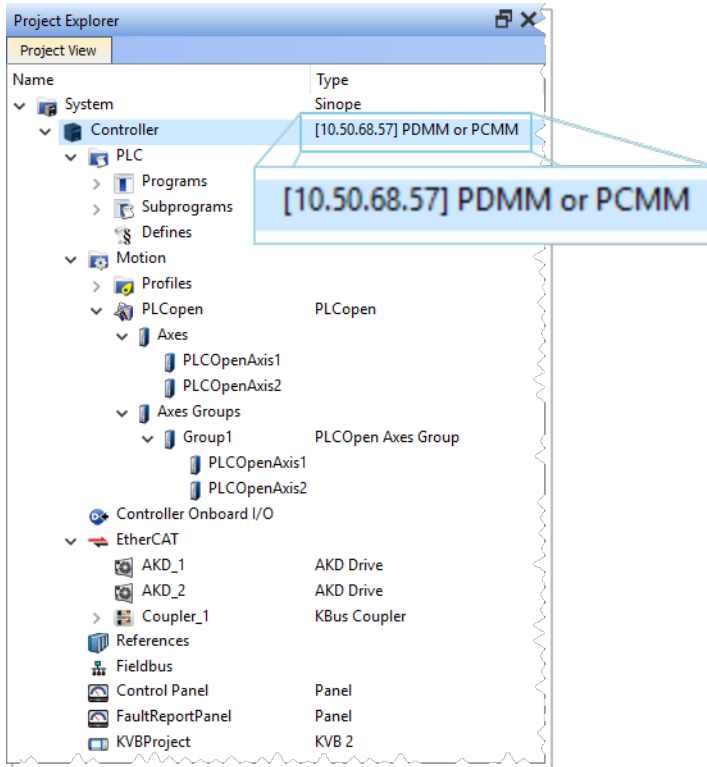

Figure 3-2: KAS Project Explorer

3.1.4 Libraries

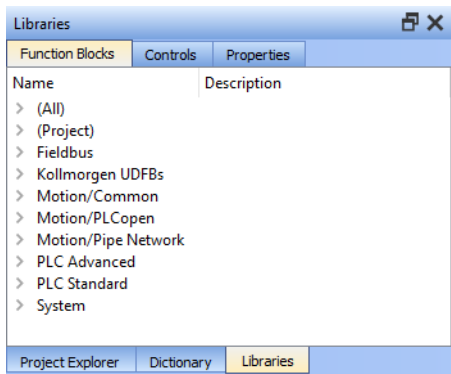This toolbox contains several tabs to access all the functions of the available libraries.

Figure 3-3: Libraries dialog box

3.1.4.1 Function Blocks tab

This tab displays all the available libraries shown in a tree-structure representation and grouped by categories. Expand a library to access all its functions. A short description of each function is available.

- Fieldbus Library
- Kollmorgen UDFBs
- Motion Library - Pipe Network
- Motion Library - PLCopen
- PLC Advanced Libraries
- PLC Standard Libraries
- System Library

3.1.4.2 Controls tab

This tab displays all the controls available for the HMI design.

3.1.4.3 Properties tab

This tab displays all the properties of an HMI control.

3.1.5 Variables tab

The Variables tab is used to show all the variables defined in the project. The variable details are displayed in order to show the variable types, dimensions, attributes, etc.
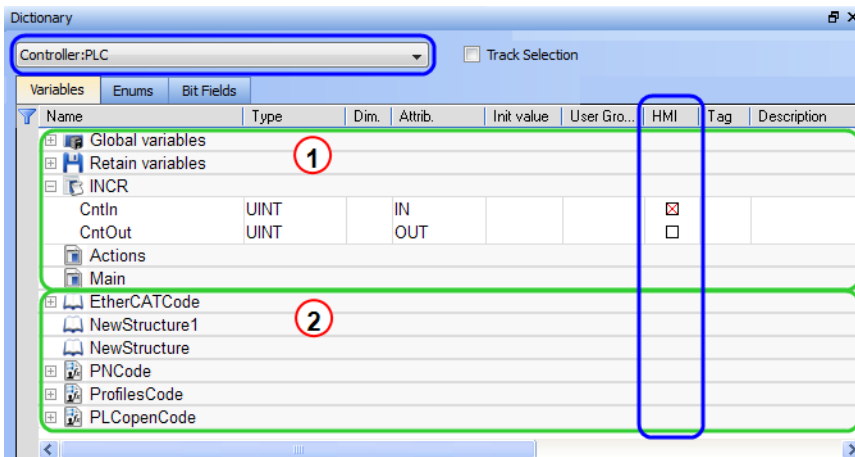

Figure 3-4: Variables tab

The list of variables is split into two parts:

Item Number	Description
1	All the Variables at the top.
2	All the Structures at the bottom.

Modify Parameters of a Variable

Mode	Description
One Parameter	In the **cell** edition mode, double-click on the parameter.
All the parameters are at the same time	In the **row** edition mode, double-click in any parameter to open the dialog box for variable configuration.

3.1.6 Information and Logs window

The Information and Log window is used to identify current state status and can be used to identify operational errors, compilation errors, and also to quickly assist you in finding areas of the workspace or program variables.

This window contains these tabs:

- Breakpoints tab with a list of breakpoints.
- Browse Variable tab
- Compiler Output tab with state reports.
- Find and Replace tab for a system search.
- Log Messages tabs (Local or Controller) including Log Messages Settings.

4   Create an Application

This exercise helps you become familiar with KAS application environment.

The Control Panel is used to create a simulated motion on two axes.

In this exercise, you will perform these steps:

- "Create a Project" (➜ p. 13)
- "Compile the Project" (➜ p. 17)
- "Start the KAS Simulator" (➜ p. 17)
- "Download the Project" (➜ p. 18)
- Start the project using the "Device Control" (➜ p. 19) buttons.
- "Operate the Control Panel" (➜ p. 19) to observe the functions in the KAS Simulator.

4.1   Create a Project

Step	Description
1	To start your project, you have to add a controller, choose which motion engine your application is based on (Pipe Network or PLCopen), and set the properties of the controller.
2	Add all AKD drives being part of your EtherCAT network and define all their parameters.
3	Add all the IO couplers and slices being part of your EtherCAT network.
4	Configure EtherCAT motion bus by mapping all the devices and setting the cycle time.
5	Create programs with the five programming languages that comply with the IEC 61131-3 standard.
6	Create variables, which can also be arrays or complex structures, and monitor them with the Dictionary, or the variable editor.
7	Create functions and function blocks that can be called from your programs.
8	Use constant definitions to ease the maintenance of your code.
9	Use the functions available in the pre-defined libraries.
10	Create your custom libraries containing your PLC code that you can use in different projects.
11	Map digital or analog inputs and outputs, that are on the EtherCAT motion bus, to PLC variables.
12	Design motion with pipe blocks in the pipe network or with PLCopen axis.
13	Create Cam Profiles that you can associate to a cam pipe block.
14	Define the number of cycles between successive executions of the PLC programs, and configure the programs priority.
15	Add an HMI device, design the KVB Panel, and map the variables.

ⓘ **IMPORTANT**

Each time the project is changed, recompile and download the new version to save the changes on the target.

4.1.1 Add the Controller

1. In the **File** menu, click **New** to start the Controller Creation Wizard.
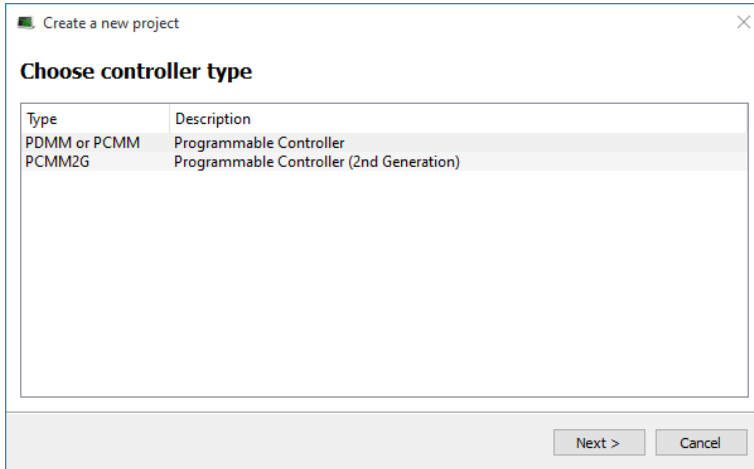2. Select the type of controller in the project.

Figure 4-1: Choose controller type dialog

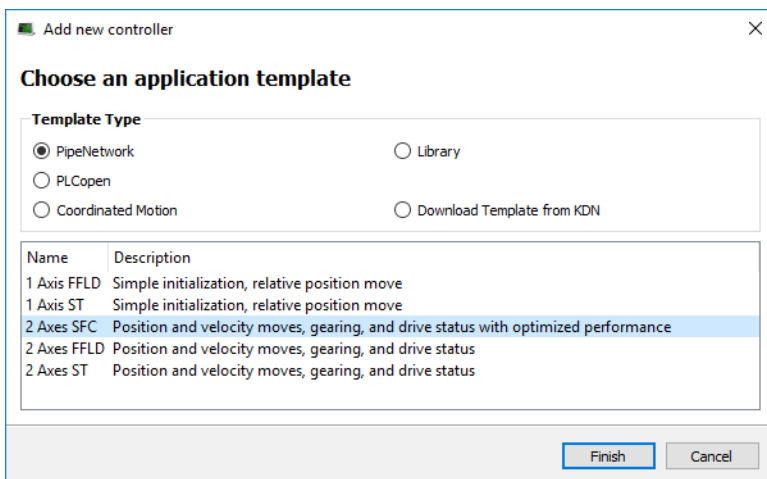3. Choose the motion engine option and select the application template.

Figure 4-2: Choose an application template dialog

4. Click **Finish**.
5. In the **File** menu, click **Save As**.
6. Define the Project Name and its location.
7. Click **OK**.

4.1.2 Configure the Controller

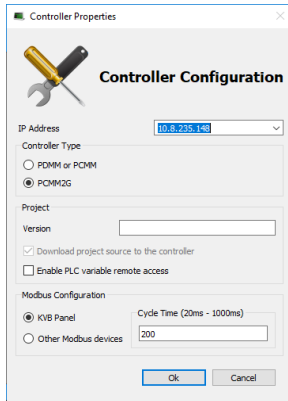The controller is configured using the **Controller Properties** dialog box.

Figure 4-3: **Controller Configuration** dialog box

Procedure

1. In the Project Explorer, right-click the new controller to open the menu and click **Properties**.
2. Choose the Controller Type.

    > ⓘ**IMPORTANT**
    >
    > The correct Controller Type must be selected before compiling the application.
    > This is because the PLC code generated for the AKD PDMM or PCMM controls and the PCMM2G have different endianness.
    > AKD PDMM / PCMM files are big endian.
    > PCMM2G files are little endian.
    > A warning opens if the application is started with an incompatible controller type.

3. Define the IP address.
4. Optional: Specify a version number (the string can be composed of any character).

    > ↖ *TIP*
    >
    > Versioning is useful to make improvements to the application and if a version control system is needed.
    > The version is saved in your project file.

5. Optional: Choose whether the project's source code should be downloaded to the controller.
    This is enabled by default and your preference is saved with the project.
    Disabling this option means a comparison of source on the controller and in the IDE is not available.
6. Optional: Choose whether PLC variables are read/written via an HTTP connection.
    This requires that the source be downloaded to the controller.
    By default this option is disabled so unauthorized changes may not be made.

    > ↖ *TIP*
    >
    > Recompile the project before downloading it to the controller.

7. Select whether Modbus goes to a KVB Panel or is handled by another Modbus device.
8. Set the **Cycle Time** (i.e., the communication update frequency).

NOTE

- If KVB Panel is selected, there is no node to add a Modbus configuration in the Fieldbus Editor.
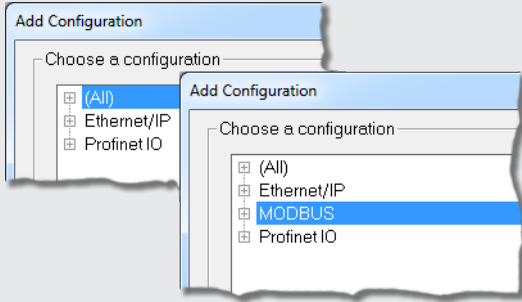

Figure 4-4: Example: KVB Panel

- If Other Modbus devices is selected, the KVB checkbox for Dictionary items is hidden. Motion configuration must be added from the Fieldbus Editor.
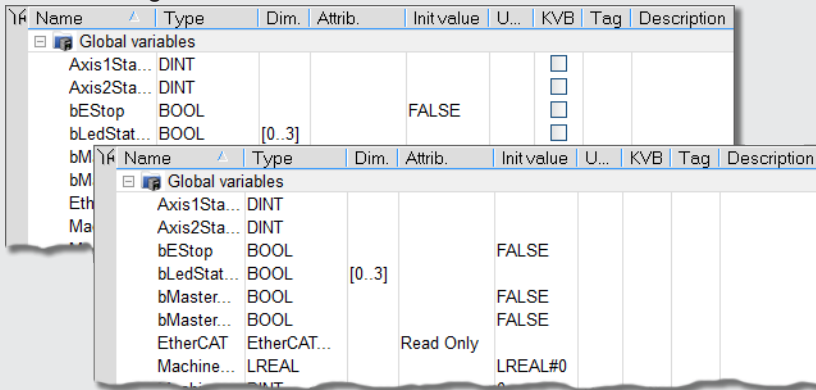

Figure 4-5: Example: Other Modbus Devices

9.   Click **OK**.

4.2   Compile the Project

After creating all the elements of your project, you are ready to compile it.

Use the Compile button ( ) on the toolbar or the **Ctrl+B** shortcut to compile the project.

4.3   Start the KAS Simulator

Click the Simulator button in the toolbar to simulate your application.

Figure 4-6: Simulator button

Once the program opens, start the simulation using the Control Panel.

4.4   Connect to the Controller

KAS provides all the commands for controlling the target in the **Device** toolbar:

> **NOTE**
>
> If a previous download failed (due to the disconnected Ethernet or the controller is turned off), the application cannot be started.
>
> Additionally:
> - No version information is shown in the web server or status bar.
> - The Start, Cold Start, and Download buttons are not available on the web server.
> - If the AKD PDMM or PCMM tries to auto-start, an E24 error is flashed on the 7-segment display. Review the Controller logs for more information.

Click the button to verify the Simulated device mode is active.

Click the **Connect Device** button ( ) to establish the connection with the target controller.

4.4.1 Actions to Prevent Compatibility Issues

> **① IMPORTANT**
>
> The software versions of the KAS-IDE and the KAS Runtime MUST match to avoid compatibility issues.

> **↖ TIP**
>
> The software versions of the KAS-IDE and the KAS Runtime are available in the local log messages (the level for this message is INFO).
> See "Information and Logs window" (➜ p. 12).

When another KAS-IDE is already connected to the controller, a warning opens and the connection is discarded to prevent any conflict.

4.5 Download the Project

Click the **Compile and Download** () button (**Ctrl + F7**) or the **Download** () button.
The application is compiled and downloaded or just downloaded to the controller.

An alert appears if:

- An attempt to Compile and Download is made without a connection to a controller.
- There is not sufficient space on the controller for the application.
  - Clearing the User Data is one method to create more space on the controller.

- In the **Controller Properties** dialog box, if the **Download Project Source in the controller** option is:
  - **Enabled** - the source code is copied to the controller.
    See "Configure the Controller" (➔ p. 15).
  - **Disabled** - and the controller has project source loaded, a message appears.
    - The message is different based on whether the current project and the project on the controller have the same name or not.

4.5.1 Project Name - Same Name
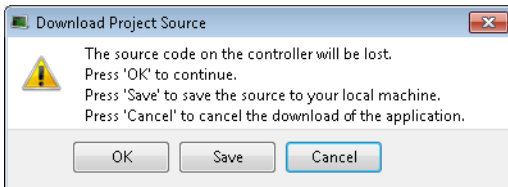
If the Project Name is the same, the message is:

Figure 4-7: Download Project Source message - Project Name = Same Name

4.5.1.1 Actions

Click either:

- **OK**: Source on controller is deleted.
- **Save**: Source on controller is overwritten and is saved to "My Documents".
  - If that source file already exists in My Documents, a prompt appears to rename the source file, overwrite that file or not.
  - If the file is not renamed or overwritten, the download to the controller is canceled.
- **Cancel**: Download is stopped.

4.5.2 Project Name - Different Name

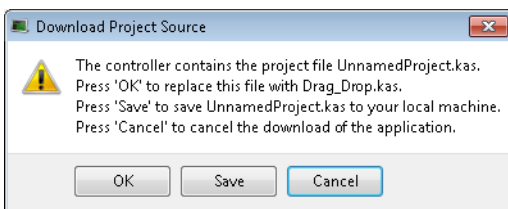If the Project Name is different, the message is:

Figure 4-8: Download Project Source message - Project Name = Different Name

4.5.2.1 Actions

Click either:

- **OK**: Source on the controller is replaced.
- **Save**: Source on the controller is saved to **My Documents**.
- **Cancel**: Download is stopped.

> **NOTE**
>
> The versions between the KAS-IDE and the KAS Runtime must be the same to debug the application.

> **⓵IMPORTANT**
>
> If the KAS-IDE version differs from the KAS Runtime after compiling an application, the function blocks defined in the KAS-IDE and those implemented in the virtual machine of the runtime can be different.
> To prevent this potential mismatch, compile and download the application again.

> **✎ TIP**
>
> The project's source code can be downloaded to store the project.

4.6 Device Control

Start / stop the device with the buttons and .

4.7 Operate the Control Panel

The Example program has a default control panel built-in to make it easy to start an application.

Use this procedure to operate the control panel:

1. Double-click **Control Panel** in the Project Explorer to open the form.
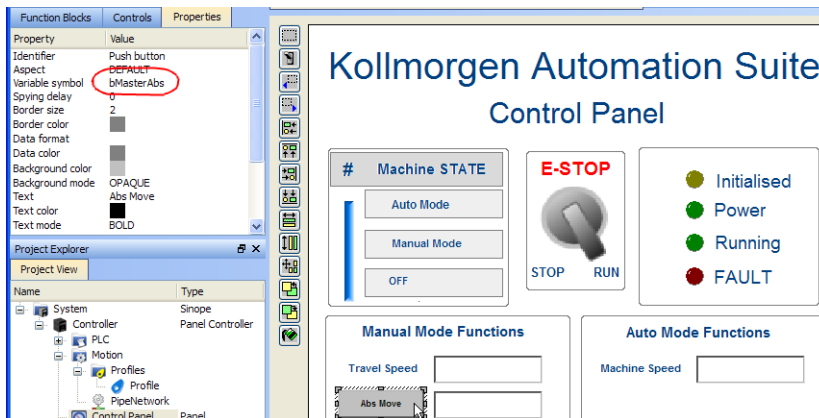

Figure 4-9: Control Panel

2. Move the vertical slider bar to select the Machine STATE as **Manual Mode**.
3. In the **Manual Mode Functions** area, double-click the text box for the **Travel Speed**.
4. Enter the numeric value for the **Travel Speed** and press <Enter>.

4.7.1 KAS Simulator Display

The KAS Simulator displays the status and position of the axes and the log messages.
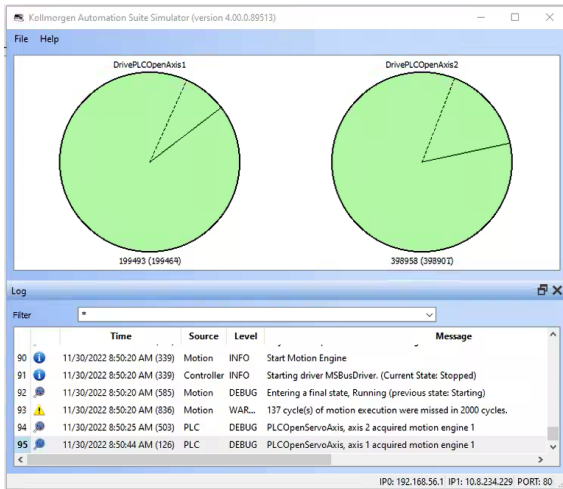

Figure 4-10: Example: Log Messages

Continue to use the Control Panel to:

- Experiment with the controls and observe the simulated output.
- Perform an absolute move by entering a position in the text box.
- Perform a relative move.

4.7.2 Exiting Simulation Mode

To exit Simulation mode, do as follows:

1. Click the **Stop Device** button ⬤.

2. Click the **Disconnect Device** button 🖾.

> **NOTE**
>
> For additional information about Kollmorgen Automation Suite, see:
> - Online Help
> - Getting Started
> - Technical Reference - PLC Library
> - Technical Reference - Motion Library
> - User Manual

Support and Services

About Kollmorgen

When you need motion and automation systems for your most demanding applications and environments, count on Kollmorgen - the innovation leader for more than 100 years. We deliver the industry's highest-performing, most reliable motors, drives, AGV control solutions and automation platforms, with over a million standard and easily modifiable products to meet virtually any motion challenge. We offer manufacturing facilities, distributors and engineering expertise in all major regions around the world, so you can bring a better machine to market faster and keep it profitable for many years to come.

Kollmorgen Developer Network

See the Kollmorgen Support Network for product support.

Search the knowledge base for answers and get product downloads.

Kollmorgen Support Locations

North America
Kollmorgen
201 West Rock Road
Radford, VA 24141, USA

Web:	www.kollmorgen.com
Email:	support@kollmorgen.com
Tel.:	+1-540-633-3545
Fax:	+1-540-639-4162

Europe
Kollmorgen Europe GmbH
Pempelfurtstr. 1
40880 Ratingen, Germany

Web:	www.kollmorgen.com
Email:	Technical.Support.EU@regalrexnord.com
Tel.:	+49-2102-9394-0
Fax:	+49-2102-9394-3155

South America
Altra Industrial Motion do Brasil
Equipamentos Industriais LTDA.
Avenida João Paulo Ablas, 2970
Jardim da Glória, Cotia – SP
CEP 06711-250, Brazil

Web:	www.kollmorgen.com
Email:	contato@kollmorgen.com
Tel.:	(+55 11) 4615-6300

China and SEA
KOLLMORGEN
Room 302, Building 5, Libao Plaza,
88 Shenbin Road, Minhang District,
Shanghai, China.

Web:	www.kollmorgen.cn
Email:	sales.china@kollmorgen.com
Tel.:	+86-400 668 2802